CAP MEANS

The invention relates to cap means that can be associated with containers, in particular cap means provided with an opening-indicator device comprising security-ring means and fin means arranged to interact with a neck of the containers.

Are already known caps that consist of a cylindrical skirt comprising a first portion, cooperating with a base wall to define a closure element that can be associated with a container and a second portion that constitutes an opening-indicator device suitable for informing a user about the integrity of a product packaged in said container.

The aforesaid second portion comprises a ring suitable for interacting with a projection obtained in the neck of the container.

Such first portion and second portion are separated by a nominal opening line consisting of a plurality of cuts, or openings, passing through the cylindrical skirt and being spaced by further bridge portions that extend between the first portion and the second portion and are designed to be broken during the first opening of the cap.

From an edge zone of the ring a plurality of fins lead away which - during use - point inwards and towards an upper part of said cap.

When the cap is opened for the first time, the fins interact with the projection to prevent detachment of the ring from the neck of the container and to promote breaking of the further bridge portions.

In order to prevent the fins being overturned around said edge zone without causing the breakage of the bridge portions, it was proposed to provide the fins with a body of considerable thickness arranged to interact with the projection, and with an appendage projecting from said body and that is received, during use, in a gap defined between the cap and the neck and that is pointed parallel to the neck.

In particular, U.S. patent N. 4546892 provides for a cap comprising a plurality of fins projecting from an opening-indicator ring.

Each fin constituted by a body of considerable thickness wherefrom a protrusion leads away that is arranged to interact with a projection obtained in the neck of a container in order to prevent the fin from overturning during opening.

A drawback of the above-disclosed cap, consists of the fact that the presence of the protrusion reduces the extension of the active surface of the fins.

Furthermore, owing to the great thickness of the body of the fins, great torque is required to apply the cap to the respective container, in such a way as to force the body of great thickness of each one of the fins beyond the projection.

This means that the bridge portions with which the cap is provided must have a cross-section of considerable extent in order not to become broken when the cap is applied to the neck of the container.

Consequently, the bridge portions may be so resistant that they do not break at the first opening, thus causing the fins to overturn and the ring to slip off the collar without separating from the body of the cap.

Furthermore, such a cap may be rather inconvenient for the user since it is difficult to open because of the great resistance that the bridge elements oppose to breaking.

U.S. patent 5096079 provides for a cap provided with fins comprising a curved part connected by means of plastic hinge with an opening-indicator ring, and a rectilinear part extending from the curved part.

Between the curved part and the rectilinear part a connecting zone is provided that is arranged to interact, during use, with a projection obtained in the neck of a container whereupon the afore-said cap has been applied.

Each fin has a constant cross-section, in such a way as to have uniform deformability along its entire extent.
In this way, the operations of mounting the cap on the neck of the container are simplified.
A drawback of the above-disclosed cap consists of the fact that, due to the great deformability of the curved part, it is necessary to rotate the cap at a large angle before the bridge elements are broken that connect the opening-indicator ring to a body of said cap, which is screwed onto said neck.
A further drawback of the above-disclosed cap, consists of the fact that the fins must be rather precisely sized.
In particular, the transversal dimension of the fins must be sufficiently limited to enable easy insertion of the cap on the neck, but at the same time be sufficiently extended to prevent excessive deformation thereof during the opening phase and therefore to prevent excessively prolonged opening times and losses of content before breaking of the bridge elements.
A yet further drawback of the above-disclosed cap consists of the fact that the major deformation to which the fins are subjected during opening may induce said fins to become flattened against the internal wall of the caps, to slide in relation thereto and to rotate towards the outside of the cap.
The cap disclosed in U.S. patent 5096079, although it can be more easily applied to a neck of a container than can the cap disclosed in U.S. patent 4546892, cannot nevertheless prevent an undesired overturning of the fins.
The known caps have a body that is internally provided with a thread that is suitable for engaging with a corresponding thread obtained in the neck of a container.
Are already known caps provided with a helical thread with a single start, i.e. defining a single cylindrical helix.
Said thread has a pitch of 3 millimetres.
The cylindrical helix extends at an angular extension that is greater than 360°.

Such caps ensure a satisfactory seal, inasmuch as a section of thread having a large extent remains engaged before the bridge elements are broken.

One drawback of the above-disclosed caps consists of the fact that the cap must have a considerable length inasmuch as a helix must be made therein with rather a large angle.

Are further already known caps provided with a helical thread with three starts, i.e. defining three mutually parallel cylindrical helixes.

Each one of said helixes has a 9 millimetre pitch.

Each cylindrical helix extends at an angle of about 120-180°.

Said caps enable a significant saving of material to be achieved inasmuch as the cylindrical helixes, because of their limited angle, can also be obtained in caps having a limited length.

A drawback of the above-disclosed caps consists of the fact that losses of fluid from the containers with which the caps are associated before breaking the bridge elements may occur.

In this case, in fact, when the opening-indicator ring interacts with the projection obtained in the neck, only sections of the thread of the caps having a limited extension engage with corresponding thread sections of the necks.

An object of the invention is to improve known cap means.

Another object of the invention is to obtain cap means provided with fin means that promotes rapid and effective detachment of the opening-indicator means from a body of the cap means.

A further object is to obtain cap means in which is prevented overturning of the fin means during opening of a container with which said cap means is associated.

In a first aspect of the invention, there is provided cap means comprising opening-indicator means having an outer edge wherefrom leads away fin means that in use extends towards the inside of said cap means, said fin means comprising, in one of

its portions nearest said edge, an elongated element having a substantially rectilinear extension, characterised in that said fin means further comprises, in one of its portions further away from said edge, flexible appendage means.

In an embodiment, the appendage means is mobile between a folded configuration, in which said appendage means is contained in the thickness of said elongated element, and an extended configuration, in which said appendage means extends substantially transversely in relation to said elongated element.

During the first opening of the cap, the fin means is made to interact with a projection obtained in a neck of a container with which the cap means is associated, in order to prevent the opening-indicator means from being detached from said neck.

During afore-said interaction, the elongated element is substantially subjected to compression stress that generates deformation of the fin means by a rather limited amount.

This cause rapid breaking of bridge elements connecting the opening-indicator means to a body of the cap means.

In particular, said breakage occurs when the seal between the cap means and the respective container is still assured.

The flexible appendage means is shaped in such a way as to partially envelope said projection in such a way as to prevent the overturning of the fin means.

As the appendage means, in the folded configuration, is contained within the thickness of the elongated element, the fin means, as a whole, has a transversal dimension that is rather limited and therefore has good deformability if subjected to stress directed radially from the centre of the cap means towards the periphery thereof.

This enables easy fitting of the cap means on the neck of the container, inasmuch as the elongated element and the flexible appendage means does not oppose a particularly significant

resistance when they are pushed beyond the projection during container-closing operations.

This furthermore enables to create bridge elements that are arranged to connect the opening-indicator means to a body of the caps and that have a cross-section with a limited extent, inasmuch as the cap means does not require high torque values to be applied to the neck of the container.

In this way, the bridge elements oppose less resistance and can easily be broken by a user during the first opening of the container.

Consequently, the risks of removing the opening-indicator means from the container during said first opening are drastically reduced, or are even completely eliminated.

In a second aspect of the invention, there is provided cap means comprising an opening-indicator means that has an outer edge wherefrom fin means leads away that in use extends towards the inside of said cap means, said fin means comprising, in one of its portions nearest said edge, an elongated element having a substantially rectilinear extension, characterised in that said fin means furthermore comprises, in one of its portions further away from said edge, flexible appendage means extending transversely in relation to said elongated element.

Owing to this aspect of the invention, the fin means has a contact zone with a projection obtained in a neck of a container, the projection having a considerable extent. This enables a particularly effective fin means to be obtained.

Furthermore, the use of the flexible appendage means induces the elongated element to be substantially subjected to compression stress.

In a third aspect of the invention, there is provided cap means comprising an opening-indicator means that has an outer edge wherefrom fin means leads away which in use extends towards the inside of said cap means, characterised in that

said fin means comprises a first portion suitable for interacting with a surface of first collar means extending radially from a neck of a container, a second portion suitable for interacting with a further surface of second collar means extending radially from said neck and a third portion suitable for interacting with yet further surface of said first collar means.

Owing to this aspect of the invention, cap means can be obtained that is provided with fin means that is not subject to overturning during opening of the container.

The fin means is subjected to deformation of limited amount, which enables the bridge elements of said opening-indicator means to be rapidly broken.

In a fourth aspect of the invention, there is provided cap means, comprising threaded means suitable for engaging in a corresponding further threaded means obtained in a container means with which said cap means can be associated, characterised in that said threaded means comprises a double-start thread.

In one embodiment, the double-start thread comprises a pair of cylindrical-helix threads, extending parallel to one another and having a pitch of 4.5 millimetres.

Owing to this aspect of the invention, cap means can be obtained provided with a limited length and, consequently, the consumption of material with which said cap means are made can be limited.

At the same time, cap means can be obtained that prevents a product from leaving a container with which the cap means is associated before breaking the bridge elements of the opening-indicator means associated with said cap means.

The invention will be better understood and carried out with reference to the attached drawings, showing some exemplifying and not limitative embodiments thereof, in which:

Figure 1 is a partial cross-section taken along a transverse plane of cap means according to the invention, showing fin means of the cap means in one configuration;

Figure 2 is a cross-section like the one in Figure 1, showing the fin means in a different configuration during the application of the cap means to a neck of a container;

Figure 3 is a cross-section like the one in Figure 1, showing the fin means after the opening-indicator means of the cap means has been separated from a body of the cap means, once a first opening of the container has occurred;

Figure 4 is a cross-section like the one in Figure 1, showing the fin means in a further configuration ;

Figure 5 is a cross-section like the one in Figure 1, showing a version of the cap means according to the invention;

Figure 6 is a cross-section like the one in Figure 1, showing a further version of the cap means according to the invention;

Figure 7 is a cross-section like the one in Figure 6, showing the fin means after the opening-indicator means has been separated from a body of the cap means, once a first opening of the container has occurred;

Figure 8 is a partial cross-section taken along a transverse plane of one embodiment of the cap means shown in Figure 6;

Figure 9 is a perspective cross-section view of cap means according to the invention, made according to a further version;

Figure 10 is a transparent schematic cross-section view of the cap means in Figure 9;

Figure 11 is a development on a plane of the internal cylindrical lateral surface of the cap means in Figure 6, highlighting thread of the cap means.

With reference to Figures 1 to 4 it has been showed a cap 1 comprising a cylindrical skirt 2 that defines a lateral surface 3 of a body 4 of the cap 1 and an opening-indicator ring 5.

The cap 1 may be made of plastic material through compression-forming or through injection moulding.

In the cylindrical skirt 2 are obtained a plurality of through cuts or openings that define a nominal opening line 13 of the cap 1.

Between adjacent through cuts are identified bridge elements arranged to connect the body 4 to the closing-indicator ring 5, these bridge elements being suitable for being broken when the cap 1 is opened for the first time.

In the body 4 is obtained a thread 6 suitable for engaging with a corresponding further thread 7 obtained in a neck 8 of a container 9 with which the cap 1 can be associated.

The opening-indicator ring 5 is provided with one or more fins 10 that lead away from an external edge 11 thereof.

The fins 10 are arranged to interact with a projection 21 made in the neck 8.

The fins 10 encourages the breaking of the bridge elements and prevents the detachment of the opening-indicator ring 5 from the neck 8 during the first opening of the container 9.

The opening-indicator ring 5 comprises a deformable zone 12 that acts as plastic hinge suitable for connecting the fins 10 to the opening-indicator ring 5.

Before the cap 1 is associated with the container 9, the fins 10 are folded inside the opening-indicator ring 5.

This may occur through a dedicated folding operation, or through the interaction of the fins 10 with the neck 8 of the container 9.

The fins 10 comprise an elongated element 14 having a first end 15 connected with the deformable zone 12 and a second end 16, opposite the first end 15, to which a further first end 17 of an appendage 18 is connected.

The appendage 18 has rather limited thickness, in such a way as to be provided with high deformability.

Furthermore, thanks to the limited thickness of the appendage 18, the fin 10 has a zone 19 of interaction with the projection 21 having a considerable extent.

The appendage 18 is mobile between a folded configuration, indicated with X in Figure 2, in which the appendage 18 is contained within the thickness of the elongated element 14, and an extended configuration, indicated with Y in Figure 1, in which the appendage 18 extends substantially transversely from the elongated element 14 to interact with the projection 21.

The appendage 18, in the extended configuration Y, partially surrounds the projection 21 in such a way as to prevent overturning of the fin 10 around the deformable zone 12 acting as hinge during the first opening of the container 9, i.e. when the cap 1 is translated in the direction indicated with arrow F.

In order to make the resistance to the overturning of the fin 10 more effective, the appendage 18 may be shaped in such a way as to interact in a shapingly coupled manner with the projection 21.

The elongated element 14 is mainly subjected to compression stress and to a deformation of limited entity that promotes rapid breaking of the bridge elements.

As in the folded configuration X the appendage 18 is contained in the thickness of the elongated element 14, the fin 10 as a whole is slimmer than the fins known in the state of the art, and it is therefore provided with greater deformability if subjected to stress directed radially from the centre of the cap 1 towards the periphery of the latter.

This enables the operations of mounting the cap 1 onto the container 9 to be significantly simplified inasmuch as the fins 10 do not oppose excessive resistance when they are forced to pass beyond the projection 21 at the positioning of the cap 1 on the neck 8.

This furthermore enables bridge elements having a limited surface cross-section to be made, inasmuch as the capsule 1 does not need to be subjected to a torque of considerable value to be applied to the neck 8.

As shown in Figure 3, once the body 4 of the cap 1 has been separated from the opening-indicator ring 5, the appendage 18 of each one of the fins 10 tends to pass from the extended configuration Y to the folded configuration X, thereby removing the opening-indicator ring 5 from the projection 21.

Thus, if the body 4, after the first use of the container 9, is screwed again on the neck 8, owing to the presence of the appendages 18, the opening-indicator ring 5 is maintained at a given distance from the body 4.

In this way, a clearer indication that the cap 1 has been opened and that any tampering with the container 9 to which the cap 1 is associated has occurred, is obtained.

In particular, the fin 10 has a thickness that is less than the difference between the diameter D of the projection 21 and the diameter d of the neck 8.

The fin 10 has furthermore a height h that is less than the distance H between a lower part 37 of the projection 21 and a disc 35 radially projecting from the neck 8.

In this way, once the container 9 has been opened for the first time, the fin can be accommodated inside a space 34 defined by the projection 21, by the disc 35 and by a portion 36 of the neck 8 comprised between the projection 21 and the disc 35.

In an embodiment, the nominal opening line 13 may extend only for a portion of the development of the cap rather than for the entire extent of the circumference thereof.

The nominal opening line 13 may comprise a cut, or an incision, or a weakening, obtained in the lateral surface 3 of the cap 1.

In addition, the opening-indicator ring 5 may be provided with a vertical cut that crosses its entire thickness.

In this case, once the bridge elements have been broken, the opening-indicator ring 5 remains connected with the body 4 and detaches itself from the neck 8.

As shown in Figure 4, can occur that, if the cap 1 is associated with a defective container 9, during the first opening thereof, the fins 10 may rotate around the deformable zone 12, thereby overturning.

In this case, the appendages 18 can have a further configuration, indicated with Z, wherein an outer surface 20 of each one of the appendages 18 interacts with the projection 21 in such a way as to prevent the opening-indicator ring 5 from detaching from the neck 8.

In other words, the fins 10 of the cap 1 according to the invention are shaped in such a way as to be effective even if associated with defective containers.

With reference to Figure 5, it has been shown a cap 1 comprising fins 10 each one of which is provided with an elongated element 14 having a first end 15 connected with the deformable zone 12 and a second end 16, opposite the first end 15, to which a further appendage 38 is connected.

The further appendage 38 extends transversely in relation to the elongated element 14 and is suitable for interacting with a projection 21 to promote, during a first opening of the container 9, breaking of bridge elements that define a nominal opening line 13 extending circumferentially around the lateral surface 3 of the cap 1.

In an embodiment, the further appendage 38 extends in a substantially perpendicular manner in relation to the elongated element 14.

The further appendage 38 comprises a zone 47 that is arranged to interact with the projection 21 and that has a considerable

surface extension, which enables the interaction between the fin 10 and the projection 21 to be optimised.

The further appendage 38 is further provided with high deformability if it is subjected to stress directed radially from the centre of the cap 1 towards the periphery thereof.

This enables the maximum torque value to which the cap has to be subjected at the moment of its application to the neck 8, to be considerably reduced.

With reference to Figures 6 and 7, it has been shown a cap 1 made according to a version and suitable for being associated with a container 9 provided with a projection 21 comprising a first collar 22 and a second collar 23.

The first collar 22 is obtained in a portion of the neck 8 that is further away from an opening zone 24 of the container 9 in relation to a further portion of the neck 8 in which the second collar 23 is obtained.

The first collar 22 and the second collar 23 are radially projected from the neck 8, so as to be adjacent to one other.

The second collar 23 has a diameter that is greater than the diameter of the first collar 22.

The cap 1 is provided with fins 10 comprising a first portion 26 suitable for interacting with a first surface 25 obtained in the first collar 22, a second portion 33 suitable for interacting with a second surface 27 obtained in the second collar 23 and a third portion suitable for interacting with a third surface 40 obtained in the first collar 22.

The first surface 25 has a cylindrical development and extends substantially parallel to the external surface of the neck 8.

The second surface 27 has an annular development and extends in a substantially perpendicularly in relation to the first surface 25.

The third surface 40 has an annular development and extends substantially parallel to the second surface 27.

The first surface 25 constitutes stop element preventing overturning of the fin around the deformable zone 12.

The second surface 27 and the third surface 40 constitute backing elements that, during the first opening, cooperate with the fins 10 to facilitate the breaking of the bridge elements.

In this way, the opening-indicator ring 5 is prevented from separating from the neck 8 after that the breakage of the bridge elements connecting the neck 8 to the body 4 fails during the first opening of the container 9,.

Furthermore, the interaction of the first portion 26, of the second portion 33 and of the third portion 39 with the first surface 25, the second surface 27 and the third surface 40, respectively, makes the fins 10 to work substantially under buckling stress, in order words to be prevailingly affected by compression stresses.

In this way, the fins 10 are subjected to limited deformation and cause rapid breakage of the bridge elements interposed between the body 4 of the caps and the opening-indicator ring 5.

In other words, the first collar 22 and the second collar 23 limit the possibility of the fins 10 being deformed by flexure.

In particular, the first surface 25 prevents the fins 10 from rotating around the deformable zone 12, thus eliminating the danger that the bridge elements are not broken during opening of the container 9 and that the opening-indicator ring 5 is removed from the neck 8 by remaining connected to the body 4.

The result is that the first surface 25 prevents the container 9 from being opened and possibly closed again without a user being made fully aware of the separation of the opening-indicator ring 5 from the body 4.

Each fin 10 takes on, during a first opening of the container 9, a configuration indicated with K in Figure 6, in which the

first portion 26 interacts with the first surface 25, the second portion 33 interacts with the second surface 27, and the third portion 39 interacts with the third surface 40.

Each fin 10 can furthermore, once the first opening of the container 9 has occurred, take on a further configuration indicated with L in Figure 7, in which the fin is arranged below the first collar 22.

In particular, in the further configuration L, the second portion 33 interacts with the third surface 40 rather than with the second surface 27, in such a way as to remove the opening-indicator ring 5 from the projection 21.

When the fin is in the further configuration L, in fact, an upper end zone 41 of the opening-indicator ring 5 is separated from a lower end zone 42 of the projection 21 by a distance l having an extension that is such as to enable unequivocal recognition of the fact that opening of the container 9 has taken place.

Each fin 10 can take on the further configuration L inasmuch as its height h1 is less than the distance between the first collar 22 and an end 43 of the neck 8 from which a rounded portion 44 of the container 9 leads away.

With reference with Figure 8, it has been shown a version of the cap 1 illustrated in Figures 6 and 7.

The cap 1 comprises a fin 10 provided with a first portion 26, a second portion 33 and a third portion 39 that are connected to each other in such a way as to give the fin 10 a step contour 45 that is suitable for engaging in shapingly coupled manner, when the fin is arranged in the configuration K, with a further step contour 46 defined by the first surface 25, by the second surface 27 and by the third surface 40.

Figures 9 to 11 show a cap 1 inside which is obtained a thread 6 suitable for engaging with a further thread 7 obtained in a neck 8 of a container 9.

The thread 6 comprises a first thread 28 and a second thread 29 extending parallel along the internal surface of the body 4.

The first thread 28 is provided with a first start 30 arranged on a plane whereupon is also arranged a second start 31 with which the second thread 29 is provided, said plane being substantially parallel to a further plane identified by an opening 32 of the cap means 1 within which the neck 8 can be received.

The first start 30 and the second start 31 are staggered by an angle of 180°.

The first thread 28 and the second thread 29 each define a cylindrical helix having a pitch of 4.5 millimetres.

In an embodiment not shown the first thread 28 and the second thread 29 each define a conical helix.